PA-E3 and PA-2E3 Serial Port Adapter

Description

The PA-E3 and PA-2E3 serial port adapters are available on Cisco 7200 series routers, on Cisco 7500 series routers, and on Cisco 7000 series routers with the 7000 Series Route Switch Processor (RSP7000) and 7000 Series Chassis Interface (RSP7000CI). These port adapters provide one (PA-E3) or two (PA-2E3) high-speed full-duplex synchronous serial E3 interfaces and integrated data service unit (DSU) functionality.

The E3 port adapters can transmit and receive data at E3 rates of up to 34 Mbps and use a 75-ohm coaxial cable available from Cisco to connect to a serial E3 network. These port adapters support the following:

- 16- and 32-bit cyclic redundancy checks (CRC)
- High-speed HDLC data
- G.751 framing or bypass
- HDB3 line coding
- ATM-DXI, Frame Relay, HDLC, PPP, and SMDS serial encapsulation
- National service bits
- E3 MIB (RFC 1407)
- Scrambling and reduced bandwidth
- Remote and local loopbacks

Note For additional information on interoperability guidelines for E3 serial port adapter DSUs, refer to the *PA-E3 Serial Port Adapter Installation and Configuration* publication.

Platforms

This feature is supported on these platforms:

- Cisco 7200 series
- Cisco 7500 series
- Cisco 7000 series routers with the RSP7000 and RSP7000CI

Configuration Tasks

Perform the tasks in the following sections to configure the PA-E3 (all tasks are optional except for the first task):

- Configure the PA-E3 Port Adapter
- Troubleshoot the PA-E3 Port Adapter
- Monitor and Maintain the PA-E3 Port Adapter

For PA-E3 port adapter configuration examples, see the "Configuration Example" section, later in this chapter.

The PA-E3 supports most interface commands. For information about these commands, refer to the "Configuring Interfaces" chapter of the *Configuration Fundamentals Configuration Guide*. For additional information on how to configure the PA-E3 serial port adapter, refer to the "Configure a Synchronous Serial Interface" section in the "Configuring Interfaces" chapter of the *Configuration Fundamentals Configuration Guide*.

For information on other commands that can be used by the PA-E3 serial port adapter, refer to the Cisco IOS Release 11.1 configuration guides.

Configure the PA-E3 Port Adapter

In addition to the commands in the "Configure a Synchronous Serial Interface" section in the "Configuring Interfaces" chapter of the *Configuration Fundamentals Configuration Guide*, the commands listed in Table 1 have been added to support the PA-E3 interface configuration.

If you do not modify the configuration of the PA-E3, the configuration defaults shown in Table 1 are used.

Table 1 PA-E3 Port Adapter Defaults

Command	Default Value
dsu bandwidth	34010 kbps
dsu mode	0
framing	g751
international bit	0 0
invert data	data is not inverted
national bit	0
scramble	disabled

If you need to change any of the default configuration attributes, complete the first task in global configuration mode followed by any of the optional tasks in interface configuration mode:

Task	Command
Select the PA-E3 interface and enter interface configuration mode.	**interface serial** *slot*/*port-adapter*/*port* (Cisco 7500 series and Cisco 7000 series routers with the RSP7000 and RSP7000CI) **interface serial** *slot*/*port* (Cisco 7200 series)
Change the DSU bandwidth.	**dsu bandwidth** *kbps*

Task	Command
Change the DSU mode. To connect to another PA-E3 port adapter or a Digital Link DSU, use the default mode (0). To connect to a Kentrox DSU, use mode 1.	**dsu mode** {**0** | **1**}
Change the framing used by the interface.	**framing** {**g751** | **bypass**}
Change the international bit used by the interface.	**international bit** {**0** | **1**} {**0** | **1**}
Invert the data stream on the interface.	**invert data**
Change the national bit used by the interface.	**national bit** {**0** | **1**}
Enable scrambling on the interface.	**scramble**

Troubleshoot the PA-E3 Port Adapter

To set the following loopbacks to troubleshoot the PA-E3 port adapter using Cisco IOS software, perform the first task beginning in global configuration mode followed by any of the other tasks depending on your needs:

Task	Command
Loopback after the LIU toward the terminal.	**loopback dte**
Loopback after going through the framer toward the terminal.	**loopback local**
Loopback toward the network before going through the framer.	l**oopback network lin**e
Loopback toward the network after going through the framer.	**loopback network payload**

These loopback commands loop all packets from the E3 interface back to the interface and also direct the packets to the network.

Monitor and Maintain the PA-E3 Port Adapter

After configuring the new interface, you can display its status. To show current status of the E3 interface on the PA-E3 port adapter, perform any of the following tasks in EXEC mode:

Task	Command
Display statistics for the E3 interface.	**show interfaces serial** *slot/port-adapter/port* (Cisco 7500 series and Cisco 7000 series routers with the RSP7000 and RSP7000CI) **show interfaces serial** *slot/port* (Cisco 7200 series)
Display the configuration information for the E3 interface.	**show controllers serial** *slot/port-adapter/port* (Cisco 7500 series and Cisco 7000 series routers with the RSP7000 and RSP7000CI) **show controllers serial** *slot/port* (Cisco 7200 series)

Configuration Example

The following example shows a typical configuration for serial interface 1/0/0 on a PA-E3 serial port adapter in a Cisco 7500 series router. The **dsu bandwidth** command reduces the bandwidth by padding the E3 frame, the **dsu mode** command enables and improves interoperability with other DSUs, and the **national bit** command sets Bit 12 in the E3 frame to 1.

```
router# configure terminal
router(config)# interface serial 1/0/0
router(config-if)# ip address 1.1.1.10 255.255.255.0
router(config-if)# clock source internal
router(config-if)# crc 32
router(config-if)# dsu bandwidth 16000
router(config-if)# dsu mode 0
router(config-if)# national bit 1
router(config-if)# no scramble
router(config-if)# framing g751
router(config-if)# no shutdown
router(config-if)# exit
router(config)# exit
router#
```

Command Reference

This section documents new or modified commands. All other commands used with this feature are documented in the Cisco IOS Release 11.1 command references.

- **clock source (interface)**
- **dsu bandwidth**
- **dsu mode**
- **framing**
- **international bit**
- **invert data**
- **loopback**
- **national bit**
- **scramble**
- **show controllers serial**
- **show diag**
- **show interfaces serial**

clock source (interface)

To control which clock a G.703 E1 interface, an E1-G.703/G.704 serial port adapter, or a PA-E3 serial port adapter will use to clock its transmitted data from, use the **clock source** interface configuration command. To restore the default value, use the **no** form of this command.

clock source {**internal** | **line**}
no clock source

Syntax Description

internal	Specifies that the interface will clock its transmitted data from its internal clock.
line	Specifies that the interface will clock its transmitted data from a clock recovered from the line's receive data stream (default).

Default

The line's receive data stream.

Command Mode

Interface configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 10.3.

This command was modified in Cisco IOS Release 11.1 CA to include the E1-G.703/G.704 serial port adapter and PA-E3 serial port adapter.

This command applies to a Cisco 4000 router or Cisco 7000 series, Cisco 7200 series, and Cisco 7500 series router. A G.703-E1 interface, PA-E3 serial port adapter, or E1-G.703/G.704 serial port adapter can clock its transmitted data from either its internal clock or from a clock recovered from the line's receive data stream.

Example

The following example specifies the G.703-E1 interface to clock its transmitted data from its internal clock:

```
interface serial 1/0
 clock source internal
```

dsu bandwidth

To specify the maximum allowable bandwidth used by the PA-E3 port adapter, use the **dsu bandwidth** interface configuration command. To return to the default bandwidth, use the **no** form of this command.

dsu bandwidth *kbps*
no dsu bandwidth

Syntax Description

kbps	Maximum bandwidth in the range of 22 kbps to 34010 kbps. The default is 34010 kbps.

Default

34010 kbps

Command Mode

Interface configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CA.

The local interface configuration must match the remote interface configuration. For example, if you reduce the maximum bandwidth to 16000 on the local port, you must also do the same on the remote port.

The **dsu bandwidth** command reduces the bandwidth by padding the E3 frame.

To verify the data service unit (DSU) bandwidth configured on the interface, use the **show controller serial** EXEC command.

Example

The following example sets the DSU bandwidth to 16000 kbps on interface 1/0/0:

```
interface serial 1/0/0
 dsu bandwidth 16000
```

Related Command

show controllers serial

dsu mode

To specify the interoperability mode used by the PA-E3 port adapter, use the **dsu mode** interface configuration command. To return to the default mode, use the **no** form of this command.

dsu mode {**0** | **1**}
no dsu mode

Syntax Description

0	Sets the interoperability mode to 0. This is the default. Specify mode 0 to connect the PA-E3 port adapter to another PA-E3 port adapter or to a Digital Link DSU (DL3100).
1	Sets the interoperability mode to 1. Specify mode 1 to connect the PA-E3 port adapter to a Kentrox DSU.

Default

0 mode

Command Mode

Interface configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CA.

The local interface configuration must match the remote interface configuration. For example, if you define the data service unit (DSU) interoperability mode as 1 on the local port, you must also do the same on the remote port.

You must know what type of DSU is connected to the remote port to determine if it interoperates with the PA-E3 port adapter. Use mode 0 to connect a PA-E3 port adapter to another PA-E3 port adapter or to a Digital Link DSU (DL3100). Use mode 1 to connect a PA-E3 port adapter to a Kentrox DSU.

The **dsu mode** command enables and improves interoperability with other DSUs.

To verify the DSU mode configured on the interface, use the **show controller serial** EXEC command.

Example

The following example sets the DSU mode to 1 on interface 1/0/0:

```
interface serial 1/0/0
 dsu mode 1
```

Related Command

show controllers serial

framing

To specify E3 line framing used by the PA-E3 port adapter, use the **framing** interface configuration command. To return to the default G.751 framing, use the **no** form of this command.

framing {**bypass** | **g751**}
no framing

Syntax Description

bypass	Specifies bypass E3 framing.
g751	Specifies G.751 E3 framing. This is the default.

Default

G.751 framing

Command Mode

Interface configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CA.

The default framing is described in the ITU-T Recommendation G.751.

Note The ITU-T carries out the functions of the former Consultative Committee for International Telegraph and Telephone (CCITT).

When the framing mode is **bypass**, the E3 frame data is not included in the E3 frame, just the data.

To verify the framing mode configured on the interface, use the **show controller serial** EXEC command.

Example

The following example sets the framing mode to bypass on interface 1/0/0:

```
interface serial 1/0/0
 framing bypass
```

Related Command

show controllers serial

international bit

To set the E3 international bit in the G.751 frame used by the PA-E3 port adapter, use the **international bit** interface configuration command. To return to the default international bit, use the **no** form of this command.

international bit {**0** | **1**} {**0** | **1**}
no international bit

Syntax Description

0 | **1**	Specifies the value of the first international bit in the G.751 frame. The default is 0.
0 | **1**	Specifies the value of the second international bit in the G.751 frame. The default is 0.

Default

0 0 international bit

Command Mode

Interface configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CA.

The **international bit** command sets bits 6 and 8 respectively of set II in the E3 frame.

To verify the international bit configured on the interface, use the **show controller serial** EXEC command.

Example

The following example sets the international bit to 1 1 on the PA-E3 port adapter in slot 1, port-adapter slot 0, interface 0:

```
interface serial 1/0/0
 international bit 1 1
```

Related Commands

national bit
show controllers serial

invert data

To invert the data stream, use the **invert data** interface configuration command. This command applies only to the Cisco 7000 series routers with the RSP7000 and RSP7000CI, Cisco 7200 series routers, and Cisco 7500 series routers. To disable this feature, use the **no** form of this command.

invert data
no invert data

Syntax Description

This command has no arguments or keywords.

Default

Data is not inverted.

Command Mode

Interface configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CA and Release 11.2 P.

If the interface on the PA-8T and PA-4T+ synchronous serial port adapters is used to drive a dedicated T1 line that does not have B8ZS encoding (a method to avoid 15 zeros), the data stream must be inverted (both TXD and RXD) either in the connecting CSU/DSU or the interface.

By inverting the HDLC data stream, the HDLC zero insertion algorithm becomes a ones insertion algorithm that satisfies the T1 requirements. Be careful not to invert data both on the interface and on the CSU/DSU as two data inversions will cancel each other out.

If the interface on the CT3IP uses AMI line coding, you must also invert the data on the T1 channel. For more information, see the **t1 linecode** controller configuration command.

Example

The following example inverts data on serial interface 3/1/0:

```
interface serial 3/1/0
 invert data
```

loopback

To loop the serial interface on a PA-E3 port adapter, use the **loopback** interface configuration command. To remove the loopback, use the **no** form of this command.

loopback {**dte** | **local** | **network** {**line** | **payload**}}
no loopback

Syntax Description

dte	Sets the loopback after the LIU toward the terminal.
local	Sets the loopback after going through the framer toward the terminal.
network {**line**	**payload**}	Sets the loopback toward the network before going through the framer (**line**) or after going through the framer (**payload**).

Default

Disabled

Command Mode

Interface configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CA.

Use this command for troubleshooting purposes.

To verify that a loopback is configured on the interface, use the **show interface serial** or **show interfaces loopback** EXEC command.

Example

The following example configures the serial interface located in slot 3/0/0 for a local loopback:

```
interface serial 3/0/0
 loopback local
```

Related Command

show interfaces serial

national bit

To set the E3 national bit in the G.751 frame used by the PA-E3 port adapter, use the **national bit** interface configuration command. To return to the default E3 national bit, use the **no** form of this command.

national bit {**0** | **1**}
no national bit

Syntax Description

0 | **1**	Specifies the E3 national bit in the G.751 frame. The default is 0.

Default

0 national bit

Command Mode

Interface configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CA.

The **national bit** command sets Bit 12 in the E3 frame.

To verify the national bit configured on the interface, use the **show controller serial** EXEC command.

Example

The following example sets the national bit to 1 on the PA-E3 port adapter in slot 1, port adapter slot 0, interface 0:

```
interface serial 1/0/0
 national bit 1
```

Related Commands

international bit
show controllers serial

scramble

To enable scrambling of the payload on the PA-E3 port adapter, use the **scramble** interface configuration command. To disable scrambling, use the **no** form of this command.

scramble
no scramble

Syntax Description

This command has no keywords and arguments.

Default

Scrambling is disabled.

Command Mode

Interface configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CA.

E3 scrambling is used to assist clock recovery on the receiving end.

Scrambling can prevent some bit patterns from being mistakenly interpreted as alarms by switches placed between the DSUs.

The local interface configuration must match the remote interface configuration. For example, if you enable scrambling on the local port, you must also do the same on the remote port.

To verify that scramble is configured on the interface, use the **show controllers serial** EXEC command.

Example

The following example enables scrambling on the PA-E3 port adapter in slot 1, port adapter slot 0, interface 0:

```
interface serial 1/0/0
 scramble
```

Related Command

show controllers serial

show controllers serial

Use the **show controllers serial** privileged EXEC command to display information that is specific to the interface hardware.

show controllers serial [*slot*/*port*]
show controllers serial [*slot*/*port-adapter*/*port*] (Cisco 7500 series and Cisco 7000 series routers with the RSP7000 and RSP7000CI)

Syntax Description

slot	(Optional) Slot number of the interface.
port	(Optional) Port number on the interface. The port value is always 0.
port-adapter	(Optional) On Cisco 7500 series routers and Cisco 7000 series routers with the RSP7000 and RSP7000CI, the location of the port adapter on a VIP card. The value can be 0 or 1.

Command Mode

Privileged EXEC

Usage Guidelines

This command first appeared in Cisco IOS Release 10.0.

This command was modified in Cisco IOS Release 11.1 CA to include sample output for the PA-E3 port adapter.

The information displayed is generally useful for diagnostic tasks performed by technical support personnel only. For the PA-E3, the **show controllers serial** command also displays configuration information such as the framing, clock source, bandwidth limit, whether scrambling is enabled, the national bit, the international bits, and DSU mode configured on the interface. Also displayed is the performance statistics for the current interval and last 15-minute interval and whether any alarms exist.

Sample Display

The following is sample output from the **show controllers serial** command for a PA-E3 serial port installed in slot 2:

```
router# show controllers serial 2/0
M1T-E3 pa: show controller:
PAS unit 0, subunit 0, f/w version 2-55, rev ID 0x2800001, version 2
idb = 0x6080D54C, ds = 0x6080F304, ssb=0x6080F4F4
Clock mux=0x30, ucmd_ctrl=0x0, port_status=0x1
Serial config=0x8, line config=0x1B0202
maxdgram=4474, bufpool=128Kb, 256 particles

   rxLOS inactive, rxLOF inactive, rxAIS inactive
   txAIS inactive, rxRAI inactive, txRAI inactive

line state: up
E3 DTE cable, received clockrate 50071882

base0 registers=0x3D000000, base1 registers=0x3D002000
```

```
mxt_ds=0x608BA654, rx ring entries=128, tx ring entries=256
rxring=0x4B01F480, rxr shadow=0x6081081C, rx_head=26
txring=0x4B01F960, txr shadow=0x60810E48, tx_head=192, tx_tail=192, tx_count=0
throttled=0, enabled=0, disabled=0
rx_no_eop_err=0, rx_no_stp_err=0, rx_no_eop_stp_err=0
rx_no_buf=0, rx_soft_overrun_err=0, dump_err= 1
tx_underrun_err=0, tx_soft_underrun_err=0, tx_limited=0
tx_fullring=0, tx_started=11504
   Framing is g751, Clock Source is Line, Bandwidth limit is 34010.
   Scrambling is enabled
   National Bit is 0, Internaltional Bits are: 0 0
   DSU mode 1
   Data in current interval (213 seconds elapsed):
     0 Line Code Violations, 0 P-bit Coding Violation
     0 C-bit Coding Violation
     0 P-bit Err Secs, 0 P-bit Severely Err Secs
     0 Severely Err Framing Secs, 0 Unavailable Secs
     0 Line Errored Secs, 0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
   Total Data (last 24 hours)
     0 Line Code Violations, 0 P-bit Coding Violation,
     0 C-bit Coding Violation,
     0 P-bit Err Secs, 0 P-bit Severely Err Secs,
     0 Severely Err Framing Secs, 0 Unavailable Secs,
     0 Line Errored Secs, 0 C-bit Errored Secs, 0 C-bit Severely Errored Secs

   No alarms detected.

PIO A: 639, PIO B: 303, Gapper register: 50DE
Framer register information:
reg 0: E0       reg 1: 0        reg 2: 0        reg 3: 0
reg 4: 0        reg 5: 8        reg 6: 0        reg 7: 0
```

show diag

To display hardware information for an interface, use the **show diag** privileged EXEC command on Cisco 7500 series routers.

show diag [**slot**]

Syntax Description

slot	(Optional) Slot number of the interface.

Command Mode

Privileged EXEC

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CA.

Use this command to determine the type of port adapter installed on a VIP2 in your router.

Sample Display

The following is sample output from the **show diag** command for a PA-E3 serial port adapter in chassis slot 2:

```
byron# show diag 2
Slot 2:
        E3 PA port adapter, 1 port
        Port adapter is analyzed
        Port adapter insertion time 1w0d ago
        Hardware revision 0.1           Board revision A0
        Serial number     4509983       Part number    73-2620-02
        Test history      0x0           RMA number     00-00-00
        EEPROM format version 0
        EEPROM contents (hex):
          0x20: 00 71 00 01 00 44 D1 1F 49 0A 3C 02 00 00 00 00
          0x30: 01 00 00 00 97 06 12 00 FF FF FF FF FF FF FF FF
```

show interfaces serial

To display information about a serial interface, use the **show interfaces serial** privileged EXEC command.

show interfaces serial [*slot*/*port*] (Cisco 7200 series)
show interfaces serial [*slot*/*port-adapter*/*port*] (Cisco 7500 series and Cisco 7000 series with the RSP7000 and RSP7000CI)

Syntax Description

slot	(Optional) Slot number of the interface.
port	(Optional) Port number on the interface. The port value is always 0.
port-adapter	(Optional) On Cisco 7500 series routers and Cisco 7000 series routers with the RSP7000 and RSP7000CI, the location of the port adapter on a VIP card. The value can be 0 or 1.

Command Mode

Privileged EXEC

Usage Guidelines

This command was modified in Cisco IOS Release 11.1 CA to include sample output for the PA-E3 serial port adapter.

For additional command syntax and sample displays, refer to the **show interfaces serial** command in the "Interface Commands" chapter of the *Configuration Fundamentals Command Reference*.

Sample Displays

The following is sample output from the **show interfaces** command for a PA-E3 serial port adapter installed in chassis slot 2:

```
Router# show interfaces serial 2/0
Serial2/0 is up, line protocol is up
  Hardware is M1T-E3 pa
  Internet address is 131.1.1.1/24
  MTU 4470 bytes, BW 34010 Kbit, DLY 200 usec, rely 128/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
  Last input 1w0d, output 00:00:48, output hang never
  Last clearing of "show interface" counters 1w0d
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     20 packets input, 2080 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants, 0 parity
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     11472 packets output, 3824748 bytes, 0 underruns
     0 output errors, 0 applique, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
     0 carrier transitions
   rxLOS inactive, rxLOF inactive, rxAIS inactive
   txAIS inactive, rxRAI inactive, txRAI inactive
```

Table 2 describes significant fields shown in the display.

Table 2 Show Interfaces Serial Field Descriptions

Field	Description
Serial... is {up | down} ...is administratively down	Indicates whether the interface hardware is currently active (whether carrier detect is present), inactive, or has been taken down by an administrator.
line protocol is {up | down}	Indicates whether the software processes that handle the line protocol consider the line usable (that is, whether keepalives are successful) or if it has been taken down by an administrator.
Hardware is	Specifies the hardware type.
Internet address is	Specifies the Internet address and subnet mask.
MTU	Maximum Transmission Unit of the interface.
BW	Indicates the value of the bandwidth parameter that has been configured for the interface (in kilobits per second). The bandwidth parameter is used to compute IGRP metrics only. If the interface is attached to a serial line with a line speed that does not match the default (1536 or 1544 for T1 and 56 for a standard synchronous serial line), use the **bandwidth** command to specify the correct line speed for this serial line.
DLY	Delay of the interface in microseconds.
rely	Reliability of the interface as a fraction of 255 (255/255 is 100% reliability), calculated as an exponential average over 5 minutes.
load	Load on the interface as a fraction of 255 (255/255 is completely saturated), calculated as an exponential average over 5 minutes.
Encapsulation	Encapsulation method assigned to interface.
loopback	Indicates whether loopback is set or not.
keepalive	Indicates whether keepalives are set or not.
Last input	Number of hours, minutes, and seconds since the last packet was successfully received by an interface. Useful for knowing when a dead interface failed.
Last output	Number of hours, minutes, and seconds since the last packet was successfully transmitted by an interface.
output hang	Number of hours, minutes, and seconds (or never) since the interface was last reset because of a transmission that took too long. When the number of hours in any of the “last” fields exceeds 24 hours, the number of days and hours is printed. If that field overflows, asterisks are printed.
Last clearing of “show interface” counters	Time the counters were last cleared.
Queueing strategy	First-in, first-out queuing strategy (other queueing strategies you might see are priority-list, custom-list, and weighted fair).
Output queue, drops input queue, drops	Number of packets in output and input queues. Each number is followed by a slash, the maximum size of the queue, and the number of packets dropped due to a full queue.

Table 2 Show Interfaces Serial Field Descriptions (Continued)

Field	Description
5 minute input rate 5 minute output rate	Average number of bits and packets transmitted per second in the last 5 minutes. The 5-minute input and output rates should be used only as an approximation of traffic per second during a given 5-minute period. These rates are exponentially weighted averages with a time constant of 5 minutes. A period of four time constants must pass before the average will be within two percent of the instantaneous rate of a uniform stream of traffic over that period.
packets input	Total number of error-free packets received by the system.
bytes input	Total number of bytes, including data and MAC encapsulation, in the error free packets received by the system.
no buffers	Number of received packets discarded because there was no buffer space in the main system. Compare with ignored count. Broadcast storms on Ethernets and bursts of noise on serial lines are often responsible for no input buffer events.
Received... broadcasts	Total number of broadcast or multicast packets received by the interface.
runts	Number of packets that are discarded because they are smaller than the medium's minimum packet size.
giants	Number of packets that are discarded because they exceed the medium's maximum packet size.
parity	Number of the parity errors on the interface.
input error	Total number of no buffer, runts, giants, CRCs, frame, overrun, ignored, and abort counts. Other input-related errors can also increment the count, so that this sum might not balance with the other counts.
CRC	Cyclic redundancy checksum generated by the originating station or far-end device does not match the checksum calculated from the data received. On a serial link, CRCs usually indicate noise, gain hits, or other transmission problems on the data link.
frame	Number of packets received incorrectly having a CRC error and a noninteger number of octets. On a serial line, this is usually the result of noise or other transmission problems.
overrun	Number of times the serial receiver hardware was unable to hand received data to a hardware buffer because the input rate exceeded the receiver's ability to handle the data.
ignored	Number of received packets ignored by the interface because the interface hardware ran low on internal buffers. Broadcast storms and bursts of noise can cause the ignored count to be increased.
abort	Illegal sequence of one bits on a serial interface. This usually indicates a clocking problem between the serial interface and the data link equipment.
packets output	Total number of messages transmitted by the system.
bytes output	Total number of bytes, including data and MAC encapsulation, transmitted by the system.
underruns	Number of times that the transmitter has been running faster than the router can handle. This might never be reported on some interfaces.

Table 2 Show Interfaces Serial Field Descriptions (Continued)

Field	Description
output errors	Sum of all errors that prevented the final transmission of datagrams out of the interface being examined. Note that this might not balance with the sum of the enumerated output errors, as some datagrams might have more than one error, and others might have errors that do not fall into any of the specifically tabulated categories.
applique	Indicates an unrecoverable error has occurred on the E3 applique. The router then invokes an interface reset.
interface resets	Number of times an interface has been completely reset. This can happen if packets queued for transmission were not sent within several seconds' time. On a serial line, this can be caused by a malfunctioning modem that is not supplying the transmit clock signal, or by a cable problem. If the system notices that the carrier detect line of a serial interface is up, but the line protocol is down, it periodically resets the interface in an effort to restart it. Interface resets can also occur when an interface is looped back or shut down.
output buffer failures	Number of no resource errors received on the output.
output buffers swapped out	Number of packets swapped to DRAM.
carrier transitions	Number of times the carrier detect signal of a serial interface has changed state. For example, if data carrier detect (DCD) goes down and comes up, the carrier transition counter will increment two times. Indicates modem or line problems if the carrier detect line is changing state often.
rxLOS, rxLOF, rxAIS	Receive loss of signal, loss of frame, and alarm indication signal status. Values are inactive or active.
txAIS, rxRAI, txRAI	Transmit alarm indication signal, receive remote alarm indicator, and transmit remote alarm indicator status. Values are inactive or active. When the router receives an LOS, LOF, or AIS, the txRAI is active. When the remote router receives an LOS, LOF, or AIS, the rxRAI is active.

Supported MIB

The PA-E3 port adapter supports a subset of RFC 1407 MIB.

We support DS3 Near End Group including—DS3/E3 Configuration Table, DS3/E3 Current Table, DS3/E3 Interval Table, and DS3/E3 Total Table.

We do not support DS3 Far End Group and DS3/E3 Fractional Group.

The PA-E3 port adapter also supports the cardTable in the Cisco Chassis MIB and the MIB-2 for each PA-E3 interface.

What to Do Next

For more information on the PA-E3 serial port adapter, refer to the *PA-E3 Serial Port Adapter Installation and Configuration* publication.